



PATENTS

8060-1006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Migaku TAKAHASHI et al.

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Examiner Nikolas J. UHLIR

MAGNETIC THIN FILM, METHOD OF PRODUCING AND  
METHOD OF EVALUATING THE SAME AND MAGNETIC  
HEAD, MAGNETIC RECORDING DEVICE AND MAGNETIC  
DEVICE USING THE SAME

**DECLARATION UNDER RULE 132**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Sir:

I, Migaku TAKAHASHI, one of the named inventors of the above-identified U.S. patent application and the current assignee, declare that I am familiar with the above-identified U.S. patent application and with the Examiner's position with respect to Japanese Patent Application No. JP 11-186033 to TAKAHASHI et al., which has been applied against the above-identified U.S. patent application.

The Examiner's position is that the FeC films of TAKAHASHI et al. will not necessarily have a perpendicular easy axis.

However, based on the perpendicular magnetic anisotropy, the FeC films of TAKAHASHI et al. will necessarily have a perpendicular easy axis.

Specifically, when a crystal phase material is used to produce a film, the macroscopic magnetization easy axis direction of the whole film resulting from the magnetocrystalline anisotropy is determined by the magnetocrystalline anisotropy proper for the phase and the orientation of the crystal phase to the substrate.

In tetragonal crystals, if the uniaxial magnetocrystalline anisotropy energy constant is positive, the easy axis will be oriented in the c-axis direction (perpendicular to the film surface). However, if the uniaxial magnetocrystalline anisotropy energy constant is negative, then the easy axis will be oriented in the c-plane (horizontal to the film surface).

The last sentence of paragraph [0018] of TAKAHASHI et al. teaches a perpendicular magnetic anisotropy value for FeC of  $4.0 \times 10^6$  erg/cc (a positive value) and claim 1 of TAKAHASHI et al. provides a range of perpendicular anisotropy energy between  $1 \times 10^6$  and  $5 \times 10^7$  erg/cc.

Since the FeC film of TAKAHASHI et al. has a positive perpendicular magnetic anisotropy value, then the crystal phase of the c-axis is an easy axis such that the easy axis will be oriented in the c-axis direction (perpendicular to the film surface).

In contrast, the FeC film as recited in claim 1 of the present application is a FeC film wherein the crystal phase of the c-axis is a hard axis and the easy axis is horizontal to the film surface. Specifically, Figure 16 of the present application shows a negative magnetocrystalline anisotropy energy constant value  $K_u$ .

The above differences between TAKAHASHI et al and the present application are due in part to the end use of the material. Specifically, the invention of TAKAHASHI et al. is related to a ferromagnetic metal compound film that is applied on perpendicular recording media. The film recited in claim 1 of the present application is a magnetic film applied on magnetic recording heads or devices in which soft magnetic materials are used. Therefore, the values of perpendicular magnetic anisotropy are fundamentally different.

The undersigned declare further that all statements made herein of their own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Declarants' signatures M. Takahashi Date 25. May 2004  
(Migaku TAKAHASHI).